USE OF LED CLUSTERS FOR SIGNALS AND THEIR MEASUREMENT

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In Australia there has been a concerted effort by many manufacturers to produce a Traffic Signal Lantern that complies with the current Standard. However, the current Standard, while being based primarily on performance criteria, is inadequate for specifying test procedures that are applicable to LED Traffic Signals and there are important characteristics of the performance of LED clusters that are not addressed in the Standard. Manufacturers have been disadvantaged in developing an LED lantern as there is no applicable Standard against which to test compliance.

This paper concentrates on Traffic Signal Lanterns manufactured with LED clusters. The types of Lantern considered include vehicular signals, pedestrian symbols, vehicular symbols (arrows, U-turns and crosses), and bicycle symbols. Symbols, e.g. the walking and standing man for pedestrians, may be filled or may be in outline. In the majority of cases that we have measured so far, the LED clusters have been manufactured from clear LEDs with a clear protective cover.

The approach taken in Australia is to supplement the existing Standard for incandescent traffic signals with specifications and test procedures that are applicable to LED traffic signals. As such a brief overview of the currents Standard will be given which will include the specifications for colour, intensity distribution, glare, and sun-phantom for 200mm and 300mm traffic signals and luminance distribution, luminance uniformity, and colour for symbolic displays.

The problems that arise when trying to apply the current Standard to LED lanterns are:
(i) the measurement of luminance and luminance uniformity for filled symbols or symbols in outline,
(ii) the measurement of sun-phantom as the reflectance in the majority of lanterns is white and consideration needs to be given as to whether a white signal generates confusion in a driver,
(iii) the measurement of veiling reflection (the white reflection from the sun) and the minimum allowed level,
(iv) the colour of yellow LEDs sometimes falls outside the current CIE boundaries,
(v) the temperature sensitivity of the LED cluster,
(vi) the electrical requirements for photometric and colorimetric testing.

A solution to each of these problems is discussed in the paper. Given that a satisfactory theoretical solution to some of these problems may be very difficult to agree on, an "engineering" solution has been proposed such that compliance with the specification will achieve an effective signal and the proposed test procedures are practical and should achieve reproducibility between laboratories.

Explanations are given as to why the Standards committee has adopted higher minimum intensities for LED traffic signals, how the intensity of the LED clusters are measured, why the minimum intensities have to be met at an ambient temperature of 55^{o}C, how the luminance and luminance uniformity for symbol displays is to be determined, the means by which the veiling reflection intensity is curtailed, the test procedure for the measurement of sun-phantom.

At the time of presentation of this paper, these are proposals that need to be considered by the Standards committee and so may change in the final publication.